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United States Department of Agriculture,
FOREST SERVICE,
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SILVICAL LEAFLET 50.

BIG SHELLBARK: KING-NUT HICKORY.

Hicoria laciniosa (Mich. f.) Sargent.

Big shellbark hickory in many respects resembles shagbark (*Hicoria ovata*). Its wood is strong and very tough, fully equal to that of shagbark, and, among the hickories, inferior only to that of the pignut or black hickory (*Hicoria glabra*). It is commonly marketed as "hickery," together with shagbark, pignut, and mockernut (*Hicoria alba*), all of which are unexcelled for vehicle construction, implement handles, and fuel. The growing demand for it has caused it to be extensively cut and it is constantly becoming scarcer. Since it is one of the most valuable of the hickories, however, its proportion in the forest should be maintained and increased, particularly in moist places.

RANGE.

The range of big shellbark embraces $9\frac{1}{2}$ degrees of latitude (from $33^{\circ} 30'$ to 43°) and $19\frac{1}{2}$ degrees of longitude ($76^{\circ} 30'$ to 96°). With the exception of eastern Pennsylvania, it grows for the most part west of the Appalachians. From central New York it ranges westward along the southern borders of Lakes Ontario and Erie and is found as far north as southern Michigan and southern Iowa. Its western limits extend from Omaha, Nebr., southward to eastern Kansas and Oklahoma. Its southern limits are southern Arkansas, northern Mississippi, and northern Alabama. It is comparatively rare in Iowa, Kansas, Oklahoma, and Arkansas, but is common in Missouri and the lower Ohio Valley. It reaches its best development both in abundance and size in southeastern Missouri, where it grows on the best soils in bottom lands.

Big shellbark is commercially important mainly in the Ohio River Valley, the Wabash and other river valleys in Indiana and Ohio, the lake region of northern Indiana, northwestern Ohio, and from the latitude of St. Louis south along the Mississippi and its tributaries, the St. Francis, White, and Upper Yazoo rivers, to its southern limit.

CLIMATE.

Big shellbark is somewhat less hardy than shagbark. The most severe climate within its range has a growing season of nearly $5\frac{1}{2}$ months, an average summer temperature of about 70° F., an absolute minimum of -26° F., and an average minimum in the coldest month of 15° F. The annual precipitation in this region averages about 37 inches, most of it in summer.

In southeastern Missouri, where big shellbark reaches its best development, it has a growing season of about $6\frac{1}{2}$ months, with an average temperature of 78° F., an absolute minimum of -25° F., and an average minimum for the coldest month of 25° F. The annual rainfall there is about 46 inches and is heaviest in the spring.

ASSOCIATED SPECIES.

Big shellbark is somewhat gregarious and often forms small groups in the forest. It sometimes forms 50 per cent of the stand on limited areas of bottom lands. In the northern portion of its range it is associated mainly with white elm, white oak, pin oak, white ash, bitternut, and shagbark; in the south with these trees and in addition with cow oak, willow oak, shingle oak, gums, pumpkin ash, red maple, pecan, water hickory, and nutmeg hickory. Big shellbark is sometimes associated even with cypress in the better-drained habitats of the latter tree.

HABIT.

The tree resembles shagbark so closely in the appearance of its bark that it is often difficult to distinguish between the two. The bark usually exfoliates in long loose strips, which cling for a long time and give the trunk a shaggy appearance. In the South, however, the bark is frequently close, firm, and regularly ridged, much like that of pignut hickory. The branches are generally heavier than those of shagbark.

At all seasons of the year big shellbark can be readily distinguished by means of the stout buff or orange-colored branchlets. The terminal buds are often an inch long, the largest of any of the hickories. The foliage is very heavy. The compound leaves, sometimes 18 inches long, have generally from 7 to 9 broad leaflets. The long leafstalks, which often persist on the branches for a year or more after the leaflets have fallen, are an excellent means of identification. The leaves, leafstalks, and young twigs are usually very hairy, though sometimes they are almost smooth. The fruit is commonly more than 2 inches in diameter. The husk is thick and the nut, which is the largest of the hickories, has a thick shell and a large, sweet kernel.

Big shellbark is usually smaller than shagbark or pignut and equals their usual size only in a limited region. In southeastern Missouri it reaches a height of 140 feet and a diameter of 40 inches.

SOIL AND MOISTURE.

Big shellbark demands a great deal of moisture. It grows only on the rich alluvial soils of river bottoms or at the bases of slopes where fertile soil has collected. The bottom lands which it frequents are often inundated for a considerable portion of the year.

TOLERANCE.

Big shellbark ranks with shagbark in tolerance of shade, and among the eastern trees is inferior only to beech, sugar maple, and pignut in ability to endure shade. Under heavy shade it grows with extreme slowness for many years, but responds readily to the increase in light and moisture following the fall of its oppressors. Stands have been noted where big shellbark, which had formed an almost complete under-story to gums, elm, cow oak, and shagbark, grew very rapidly after the removal of these larger trees.

GROWTH AND LONGEVITY.

Seedlings of big shellbark grow more rapidly at the start than those of any of the true hickories. This is doubtless due to the abundance of food stored in the large nuts. During the first three years heights of 5, 8, and 12 inches, respectively, are attained. After that in full sunlight and on fair soil the growth will usually average one foot a year for twenty-five or thirty, rarely forty, years, when it begins to fall off. Diameter growth under favorable conditions should average $1\frac{1}{2}$ inches in ten years.

The growth of big shellbark is persistent, and forest-grown trees commonly attain an age of from 200 to 250 years, and sometimes 350 years.

REPRODUCTION.

Big shellbark produces a good crop of nuts every year or two, and full-grown, thrifty trees will frequently bear 2 or 3 bushels of shelled nuts. On account of their size the sweet-kerneled nuts are less apt to escape the squirrels, hogs, and other animals which feed upon them than the smaller nuts of shagbark and pignut, but this disadvantage is largely offset by the vigor of the seedlings which do get a start. On the river bottoms along the Mississippi, where most of it is found, the reproduction of big shellbark, as well as of the other species of hickory, is generally poor, probably on account of the inundations to which this land is subjected. Farther north it is better but is less abundant than that of shagbark or pignut.

In its ability to produce sprouts big shellbark is inferior to shagbark and pignut. This is probably largely due to the fact that it grows in river bottoms where annual inundations keep the roots covered with silt, so that they sprout less readily. Cutting also has been less exten-

sive here than in situations adapted to shagbark and pignut, so that there is a larger proportion of overmature trees which have lost their ability to sprout profusely. Big shellbark is, however, a fairly vigorous sprouter, and young trees can probably be depended upon to sprout consistently.

MANAGEMENT.

This tree, like the other hickories, is adapted to management either by the simple coppice system or the selection system. For the production of small-sized material no method seems better adapted than that of clear cutting and reproduction by sprouts. Since the sprouting capacity falls off rapidly with age, in order to secure satisfactory reproduction the trees should be cut as soon as they are large enough to use. This method can be applied to big shellbark only in pure stands, such as are occasionally found along river bottoms.

In mixture with faster-growing oaks, ashes, and other species, or when large-sized material is desired, the hickories should be managed by the selection system, to which they are peculiarly adapted on account of their ability to endure shade and to make good growth after suppression. Natural reproduction can be readily obtained through the opening of the stand by the removal of mature trees.

Since slow-growing material is relatively weak and brash, the object of management should be to make the trees free themselves of branches early, and then, after a sufficient clear length has been obtained, to induce rapid growth. This may be accomplished by repeated thinnings at intervals of about ten years. Big shellbark should be favored on moist or wet soils, while on fresh, fertile soils, either shagbark or pignut is preferred, the former for the fine quality of its nuts and the latter for its superior wood. On dry, sandy soils, pignut is the species to be favored.

Approved:

JAMES WILSON,

Secretary of Agriculture.

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